EPA New England Office | Center for Environmental Industry & Technology

TECHNOVATION

CURRENT NEWS AND EVENTS ON INNOVATIVE ENVIRONMENTAL TECHNOLOGIES • VOLUME 1999 — 2

1999 ENVIRONMENTAL INNOVATOR AWARDS SHOWCASE INSIDE

The Second Annual New England Environmental Innovator Awards

EPA Region I - New England's Environmental Technology Innovator Award Program is now in its second year. This year, eight winners were selected from a pool of thirty-five applicants, as representing New England's most innovative technologies. The selection process was administered by EPA's Regional Science Council. The council evaluated each application based on the following criteria: (1) the ability of the technology to address an environmental problem, (2) the ability of the claims to be verified, (3) field trial evaluations, and (4) innovativeness.

The awards were presented to the winners at the New England Environmental Expo, held May 5 in Boston.

1999 Award Winners (seen here with EPA-New England Regional Administrator John P. DeVillars) at the New England Environmental Expo.

The award recipients were:

- **Ecosystem Consulting Service, Inc.**, Coventry, Conn.
- **Environmental Research Corps,** Freetown, Mass.
- **Innovatech,** Boston, Mass.
- **Kady International,** Scarborough, Maine
- **Micromag Corporation**, Framingham, Mass.
- **SITELAB Corporation**, Wellesley, Mass.
- **StormTreat Systems, Inc.**, Sandwich, Mass.
- **Strategic Diagnostics, Inc.**, Natick, Mass.

This issue of *Technovation* highlights the 1999 Environmental Technology Innovator Award winners and showcases their technologies.

Meet the New CEIT Director

Maggie Theroux, CEIT Director

The new Director of EPA's Center for Environmental Industry and Technology (CEIT) is Maggie Theroux. Her first official duty as Director was to participate in the presentation of EPA-New England's Environmental Technology Innovator Awards. As a former entrepreneur, she has been impressed with EPA Region I's commitment to recognize innovative environmental technologies with the awards.

Before joining EPA, she earned an MPA at Harvard University's Kennedy School of Government with a focus on environmental policy. Prior to the Kennedy School, she worked in the computer industry and her experiences included starting a chain of retail computer stores in the UK, computer consulting, and marketing with IBM. She attended the Kennedy School in order to combine her business and entrepeneurial expertise with her environmental interests. She was attracted to CEIT because it's an innovative program for EPA and its mission is consistent with her career aspirations.

1999 Environmental Innovator Awards Showcase

See disclaimer on page 7

Layer Aeration

Installation of a Layer Aeration System in a water supply reservoir in New Jersey.

Layer Aeration, which has been awarded a U. S. Patent, has been used in lakes and supply reservoirs in New England and around the country. The technology was developed to improve water and habitat quality in lakes and reservoirs for fishery restoration, water supply source improvement, and lake restoration. **Layer Aeration** addresses the causes and consequences of eutrophication.

Unlike other aeration methods which are dependent on "mechanical" oxygen input, **Layer Aeration** actually uses biological oxygen sources. It creates and aerates discrete layers at selected depths, bounded by functional thermoclines above and below. The method "balances" photosynthetic oxygen production and respiratory oxygen demand. It utilizes natural biological processes to decrease dependence on large compressor systems (saving energy and cost). Recent technology advances in the **Layer Aeration** process have included a "down bubble contact reactor" function which enhances gas-solute phase transfer and improves efficiency further, and submerged systems.

Layer Aeration is useful for cost-effective water supply quality improvement (at intake depths) and for cold water habitat restoration. The method is best for deep eutrophic lakes that thermally stratify.

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BioFence™

Environmental Resource Corps (ERC) is the first company to be a "back-to-back" winner of EPA's Environmental Technology Innovator Awards —last year for the Howland Swale and this year for the **BioFence**.™ The **BioFence**™ was also recognized in 1998 by the International Erosion Control Association and received their Award for Environmental Excellence. "These awards have brought a phenomenal response," writes Mark Howland, Chief Biologist at ERC. "We have logged 5,673 requests for product literature, and other information regarding one or the other product."

BioFence,™ an alternative to a hay bale and plastic fence, is for use in areas that need to be protected from silt, erosion materials, and sedimentation.

BioFence™ protecting wetlands from silt and erosion during an interstate installation project on a major U.S. highway.

The advantages of **BioFence**™ are that it:

- provides greater silt removal than the hay bale/plastic fence;
- uses materials that are totally biodegradable and non-toxic;
- unlike most hay bales, is not contaminated with plant materials that can invade wetlands; and,
- is made in the U.S.—offering price advantages over imported products.

According to ERC, **BioFence**™ has several advantages in silt removal. The product is 10 to 20% better than a hay bale/plastic fence combination in catching silt. **BioFence**™ is composed of aspen wood fibers. The irregular edges of the wood fibers catch small silt particles better than the round edges of a piece of straw or the smooth plastic fibers of a silt fence.

BioFence™'s backing material is made of burlap stiffened with corn starch. Unlike plastic silt fences, the burlap will swell during a storm event tightening the weave and trapping silt on its own. It dries out after a storm allowing the opening to re-establish itself to permit water to pass through.

Most traditional black plastic fences are attached to stakes by stapling. Staples are thin, flimsy attachments for the

weight fill can place against a fence. **BioFence**™ stakes are made by sewing looped seams to inserted wooden stakes. The stakes are installed as part of the assembly so that the unit is ready-to-install. **BioFence**™'s 4' stakes place the stake 18" into the ground rather than the usual 8".

BioFence™ has five variations: (1) **BioFence**™ Plus — wild flowers embedded in the fence; (2) **BioFence**™ with EcoGuard — a natural oil absorption boom in the fence; (3) **BioFence**™ with Skeeter Guard — fence impregnated with Bti mosquito larvicide; (4) **BioFence**™ Skeeter Repel—fence coated with pyrathenum to repel adult mosquitoes; (5) **BioFence**™ Superior—heavyweight/high velocity grade for steep runoff situations.

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KADY Bio-Lysis System™

KADY International's innovative technology, the **KADY Bio-Lysis System**™ (**BLS**), reduces the volume and weight of disposable sludge produced by wastewater treatment plants. The **KADY BLS**™ is a technique that shears and breaks apart solid particles and ruptures microbial cells in biological wastewater sludge. By breaking the cell wall, the cytoplasm contents are available as a food source for living organisms in the wastewater treatment (WWT) plant. The resultant product of solubilized cytoplasm, fragmented particles and free water can be returned to the aeration system, rather than be removed as solid waste. The reduction in biosolids (sludge) through the **KADY BLS**™ results in smaller quantities of sludge to be pumped, thickened, dewatered and disposed. In addition, the destruction of particulate matter and cell structure results in wastewater biosolids that are more easily dewatered using conventional dewatering equipment.

According to Kent Peterson of Kady International, this KADY technology offers a cost-effective solution for reducing one of the largest operating costs in the WWT plant. The **KADY BLS**™ is a small, compact unit that is easily installed in an exiting process stream. It is energy efficient and requires little operating intervention. The reduction in biosolids results in lesser quantities which must be handled by further processing. Thus, there are less biosolids to be dewatered, less to be stored, less to be transported to disposal, and less to be disposed of in landfills, by land spreading, or by incinerating. When installed in an activated sludge treatment plant, the **KADY BLS**™ permits the plant to reduce its operating costs by consuming a substantial portion of the secondary biosolids generated.

The **KADY BLS**™ was demonstrated at a 15 million gallons per day activated treatment plant in Portland, Maine in 1997. The 12-month study showed a 50% reduction in biosolids. An additional pilot study was completed in 1998 at the Detroit Water and Sewage Department which showed a 33% reduction in biosolids. In addition to sludge reduction, **KADY BLS**™ was reported to improve BOD, COD, TSS, and PO_4 in the pilot effluent.

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About CEIT

EPA's Center for Environmental Industry and Technology (CEIT) is moving forward with our mission to promote New England's environmental technologies. We have embarked on numerous programs and projects designed to sustain the strength of the environmental industry, make it easier to commercialize new technologies, provide more flexibility for environmental technologies buyers, reduce costs for the regulated community and increase New England's environmental exports. The CEIT acts as a point of contact for the environmental industry, technology developers, investors and other interested stakeholders, providing an ombudsman service for those seeking assistance on the development of new technologies.

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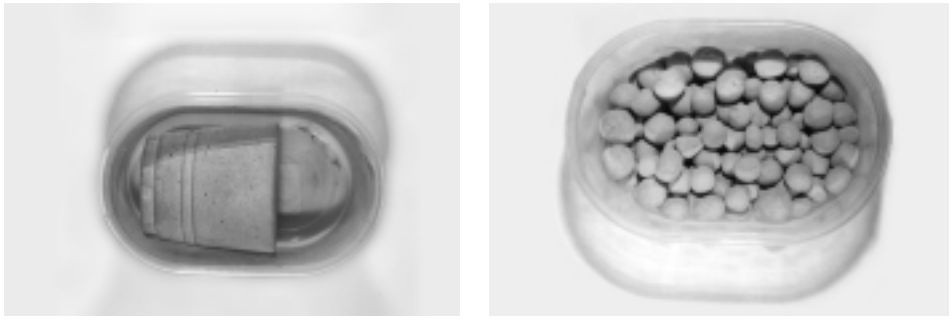
ETHEC



Concrete product samples from contaminated Salem, MA Harbor sediment.

Dr. Alex Gurfinkel has developed and patented **ETHEC** (Electro-THErmo-Chemical), a technology which integrates electrical, thermal, and chemical techniques for cleaning up and recycling hazardous wastes and other contaminated materials. The **ETHEC** process and systems are designed to provide a one-step cleanup/recycling operation.

The **ETHEC** process extracts and separates water and vaporizable organics from wastewater or sludge and produces pure water and usable organic complexes. Contaminated sediments, soils or other residues can be cleaned up by extracting the organics or through **ETHEC's** manufacturing of beneficial use products. The **ETHEC** technology simultaneously treats the contaminated material and the contaminants without using chemicals in the process. Any heavy metals left in the processed material are stabilized by a thermo-chemical reaction during the final step of recycling the treated waste into either fill, aggregate, or building materials.

ETHEC systems are designed as mobile, fixed, or in-line installations. The mobile and fixed systems can be used for on-site and off-site remediation, respectively, and the in-line systems, for both remediation and pollution prevention. These in-line systems can be adjusted for optimal operation, while the mobile and fixed systems can be adjusted to produce the selected beneficial products. The system is closed-loop so it does not emit any contamination into the atmosphere.

This technology can be used in dredging projects, hazardous and industrial waste cleanup projects, and in treating municipal wastewater. **ETHEC's** target waste streams include soil, sediment, wastewater, sludge, industrial waste, and chemical and biological contamination.

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CoMag Process

Micormag Corporation was formed in 1997 to address serious eutrophication of a ten-mile stretch of ponds and streams comprising the Hop Brook recreation and wildlife resource area in Marlborough, Massachusetts. In response, Micromag Corporation developed the **CoMag Process** potentially applicable to a broad range of municipal and industrial wastewater treatment facilities. The process is particularly effective for the removal of phosphorus and can remove fecal coliform and other pathogens without the use of chlorine.

The **CoMag Process** incorporates a dynamic, magneto-chemical pre-treatment process which enhances the precipitation of dissolved contaminants. The process also adds a fine magnetite powder (magnetic seed) and a chemical flocculant. The flocculant binds all of the fine particulates in the fluid stream, including the precipitated phosphorous, to magnetite powder, which can then be filtered at very high rates using High Gradient Magnetic Separation (HGMS) technology. A means for recycling the magnetic seed is incorporated into the process so that it is not lost in the final sludge.

In conjunction with the Mass. DEP, the EPA, and the City of Marlborough, the technology has been demonstrated in a full process, continuous duty, pilot plant at the MEWWTP. Within a year the new process demonstrated its ability to reduce phosphorous to 0.01 mg/l. The plant study for the Marlborough application estimated its cost at less than half that of existing technology.

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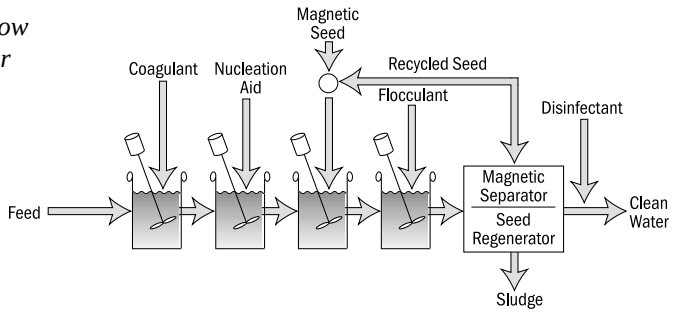
Simplified flow schematic for the CoMag Process.



*site*LAB® UVF Analytical Test Kit

After one and a half years of research and development ***site*LAB**® was incorporated in Massachusetts in the spring of 1998. The corporation consists of several business partners and employees and sells its products throughout the U.S. The ***site*LAB**® UVF Analytical Test Kit was developed and patented by Steve Greason, an Environmental Science graduate from University of New Hampshire, with 10 years experience in the environmental industry.

The UVF Analytical Test Kits are designed to measure a variety of petroleum hydrocarbons, including total petroleum hydrocarbon (TPH); volatile petroleum hydrocarbon (VPH); extractable petroleum hydrocarbon (EPH) aromatic fractions; polycyclic aromatic hydrocarbon (PAH); benzene, toluene, ethyl benzene, and xylene (BTEX); and polychlorinated biphenyls (PCBs). According to ***site*LAB**®, the kits are fast, accurate and cost-effective. Soil or water samples are extracted in solvent and then analyzed on a portable ultraviolet fluorometer (UVF), which is calibrated using the same type of certified standards conventional laboratories use for gas chromatograph/mass spectrometer (GC/MS) analysis.

The UVF Analytical Test Kits provide on-site data useful to many regulatory agencies, utilities, consultants, contractors and project managers. Applications include commercial and residential soil excavation projects, underground storage tank (UST) spills, site assessments, geoprobe investigations, non aqueous phase liquid (NAPL) plume studies, emergency response situations, mobile or field laboratories and dilution screening for commercial labs prior to GC/MS analysis.

"The ***site*LAB**® test kits are the only available screening tools capable of measuring VPH and EPH, which will directly correlate to off-site laboratory GC results," says Greason, "As a result, far fewer samples need to be sent off-site for confirmatory analysis. This, in combination with its speed and low cost per sample, can assist customers better and much more quickly in delineating the extent of contamination and reduce the cost of cleaning up a site, not only in terms of savings on analytical costs, but also savings on disposal, treatment, site work time, and labor."

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About CEIT

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Highlights of our services include:

- **Golden Opportunity Series**
  Through this series, participants learn about technology transfer; assistance and verification opportunities; international marketing assistance and trade opportunities; and financing opportunities.
- **Technology Trade Shows**
  Technology Trade Shows showcase new and innovative technologies. Trade shows for 1999 are focused on stormwater treatment technologies and on-site wastewater treatment technologies.
- ***Technovation***
  CEIT's technical bulletin highlights promising technologies developed by New England companies.
- **Ombudsman Hotline**
  The CEIT offers assistance, information, and referrals on a wide range of federal and state programs to the industry through its Ombudsman Hotline: **1-800-575-CEIT**.
- **CEIT HomePage**
  A visit to our home page at **www.epa.gov/region01/steward/ceit** will give you up-to-date information on business opportunities, upcoming events, and links to other web sites of interest to the envirotech industry.
- **Program Notification Service**
  The CEIT conducts a Program Notification Service, a mailing and an on-line information service, which notifies technology developers of national program solicitations.

If you would like to know more about CEIT services or events, please contact Maggie Theroux, Carol Kilbride or Junenette Peters of CEIT at **1-800-575-CEIT (2348)** or **617-918-1783**.

StormTreat™ System

Stormwater pollution is a leading cause of non-attainment of water quality standards throughout the New England region. The majority of closed shellfishing areas receive direct and untreated stormwater discharges.

The **StormTreat™ System** is designed to treat stormwater by capturing the first flush of stormwater runoff, which contains 90% of pollutants. The system provides high levels of treatment for a broad range of pollutants. It also saves space by reducing the need for detention basins. An optional infiltration feature provides for the treatment of larger quantities of stormwater (beyond the first flush).

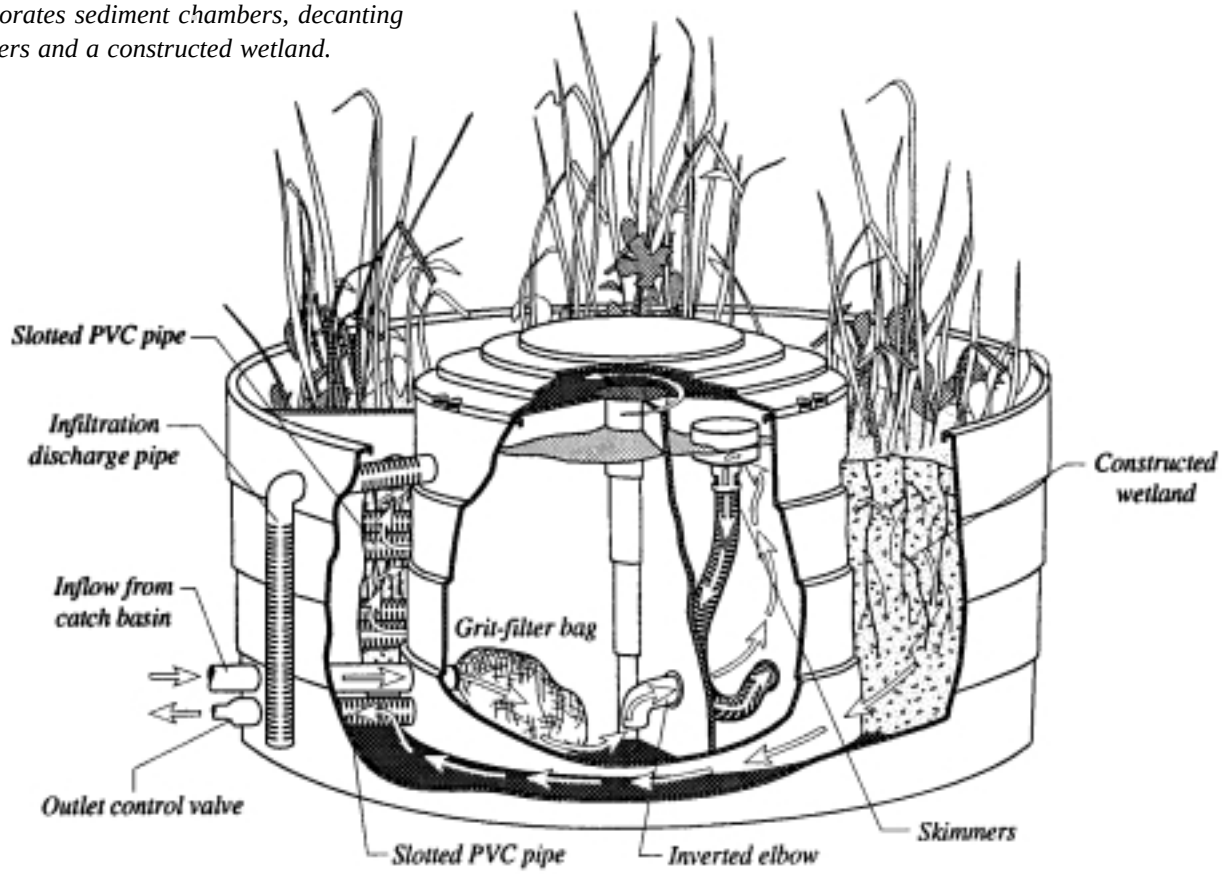
The **StormTreat™ System** is constructed of recycled polyethylene which connects directly to existing drainage structures. The system consists of a series of six sedimentation chambers and a constructed wetland which are contained within a modular 9.5-foot diameter and 4-foot deep tank.

Stormwater is piped through a preliminary detention structure (open detention basin, underground tank and piping), which provides pre-treatment and storage of the first flush volume, and then into the **StormTreat™ System**. The water then enters the sedimentation chambers where larger-diameter solids are removed. The internal sedimentation chambers contain a series of skimmers which selectively decant the upper portions of the stormwater in the sedimentation basins, leaving behind the more turbid lower waters. The skimmers significantly increase the separation of solids compared with conventional settling/detention basins. An inverted elbow trap serves to collect floatables such as oils within the inner tank.

After moving through the internal chambers, the partially treated stormwater passes into the surrounding constructed wetland through a series of slotted PVC pipes. Unlike most wetlands constructed for stormwater treatment, the **StormTreat™ System** conveys stormwater into the subsurface of the wetland and through the root zone, where greater pollutant attenuation occurs. The stormwater is then discharged through the outlet valve, which provides a five-day holding time within the system. The valve can be closed to contain a hazardous waste spill.

The **StormTreat™ System** is the first stormwater treatment technology to be officially verified by the Massachusetts

Schematic of the StormTreat System. The system incorporates sediment chambers, decanting skimmers and a constructed wetland.



Strategic Environmental Program (STEP). This verification was based upon a detailed review by the University of Massachusetts environmental technology staff. A report by the Massachusetts Executive Office of Environmental Affairs states that "the StormTreat System can provide removal rates of at least 80% for TSS when sized appropriately. In fact, in situations where the climate, land use intensity and soil conditions are similar to those found in your Kingston demonstration site, your technology may indeed achieve TSS removal rates as high as 98%."

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Strategic Diagnostic Inc. Immunoassay Test Systems

Strategic Diagnostic Inc. (SDI) was formed with the 1996 mergers of Strategic Diagnostics, EnSys, Millipore's EnviroGard, and Ohmicron Environmental Diagnostic. The company is headquartered in Delaware and has a regional office in Massachusetts. SDI provides the environmental marketplace with immunoassay testing products.

Immunoassay analysis has been used for more than 40 years in the medical profession as a tool in clinical diagnostics, with over a billion clinical tests performed annually in the U. S. Immunoassay testing techniques are now being applied to environmental analysis, where immunoassay based test kits provide environmental professionals with a fast, simple low-cost method for performing on-site analyses of many regulated contaminants in water, soil, and other environmental matrices. Immunoassay based test kits for the analysis of environmental contaminants are predominantly of the competitive enzyme-linked immunosorbent assay (ELIZA) type.

In competitive ELIZA's, the sample to be tested is combined with an enzyme labeled analog of the analyte and the analyte specific antibody. Both the unlabeled (sample) analyte and the enzyme labeled anaylyte analog then compete for a limited number of antibody sites and bind to antibodies in direct proportion to their relative concentration in the reaction mixture.

Field application of SDI immnoassay test kits.

After an incubation period, the antibody with the labeled and unlabeled analyte bound to it are separated from the unbound substances. Color producing reagents are then added to the antibody-contaminant complex and allowed to develop color during an incubation step. Since the labeled antigen analog was in competition for the antibody sites with the target analyte contained in the sample, less color indicates a higher concentration of analyte.

Environmental **immunoassay test kits** have been designed to be specific to individual compounds such as individual pesticides, or to be sensitive to compound groups such as PAHs, PCBs or petroleum hydrocarbons. When combined with simple field sample preparation techniques, immunoassay technology may be used to analyze many different types of environmental matrices, including soil, surfaces (wipes), sediments, sludge, compost, concrete and others. There are several different types or "formats" for environmental immunoassay, each having different features and application characteristics. SDI formats of immunoassay field test kits include latex particles (D TECH), coated tube (EnSys and EnviroGard), and magnetic particle (RaPID Assay) types. SDI's **immunoassay test kits** can provide three types of analytical results: qualitative, semi-quantitative, or quantitative data results.

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NEWMOA Technology Review Committee
Advisory Opinion on Immunoassay Field Analysis

Several groups in New England recognized the need for a regional effort to overcome regulatory and institutional barriers to the acceptance of innovative technologies, which have the potential to cleanup and protect the environment and public's health in a more cost-effective and efficient manner. As a result, in March 1998, the six New England States, EPA Region I - New England, the Northeast Waste Management Officials' Association (NEWMOA) and the New England Governors' Conference signed a Memorandum of Agreement (MOA) to promote interstate regulatory cooperation for waste site assessment and cleanup technologies.

NEWMOA subsequently established a Technologies Review Committee (TRC) to address the lack of an interstate forum in the Northeast to actively review technologies and communicate both private and public sector use of innovative technologies. The TRC is made up of one or more staff members from each of the New England states and New York who coordinate state review, issue advisory opinions and disseminate information on the use of innovative technologies.

On May 24, 1999, the TRC issued an advisory opinion on Immunoassay Field Analysis.

As an overview, the Advisory Opinion states that the primary advantage of immunoassay analysis is that analytical results can be generated in real-time allowing decision-making in the field regarding the need for additional sampling or further remediation (provided that proper data validation procedures are followed). It strongly urges potential users of immunoassay to consult U.S. EPA Region I's *Immunoassay Guidelines for Planning Environmental Projects* (October 1996) and with kit vendors *prior* to planning the field effort. The Advisory Opinion also includes ten (10) recommendations for improving or insuring product performance.

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